

PART E. TYPE 4 GENERAL PERMITS**R18-9-E301. 4.01 GENERAL PERMIT: SEWAGE COLLECTION SYSTEMS**

- A. A 4.01 General Permit allows for construction and operation of a new sewage collection system or expansion of an existing sewage collection system involving new construction as follows:
 - 1. A sewage collection system or portion of a sewage collection system that serves downstream from the point where the daily design flow is 3000 gallons per day based on Table 1, Unit Design Flows, except a gravity sewer line conveying sewage from a single building drain directly to an interceptor, collector sewer, lateral, or manhole regardless of daily design flow;
 - 2. A sewage collection system that includes a manhole; or
 - 3. A sewage collection system that includes a force main or lift station serving more than one dwelling.
- B. Performance. An applicant shall design, construct, and operate a sewage collection system so that the sewage collection system:
 - 1. Provides adequate wastewater flow capacity for the planned service area;
 - 2. Minimizes sedimentation, blockage, and erosion through maintenance of proper flow velocities throughout the system;
 - 3. Prevents releases of sewage to the land surface through appropriate sizing, capacities, and inflow and infiltration prevention measures throughout the system;
 - 4. Protects water quality through minimization of exfiltration losses from the system;
 - 5. Provides for adequate inspection, maintenance, testing, visibility, and accessibility;
 - 6. Maintains system structural integrity; and
 - 7. Minimizes septic conditions in the sewage collection system.
- C. Notice of Intent to Discharge. In addition to the Notice of Intent to Discharge requirements specified in R18-9-A301(B), an applicant shall submit the following information:
 - 1. A statement on a form approved by the Director, signed by the owner or operator of the sewage treatment facility that treats or processes the sewage from the proposed sewage collection system.
 - a. The statement shall affirm that the additional volume of wastewater delivered to the facility by the proposed sewage collection system will not cause any flow or effluent quality limits of the individual permit for the facility to be exceeded.
 - b. If the facility is classified as a groundwater protection permit facility under A.R.S. § 49-241.01(C), or if no flow or effluent limits are applicable, the statement shall affirm that the design flow of the facility will not be exceeded;
 - 2. If the proposed sewage collection system delivers wastewater to a downstream sewage collection system under different ownership or control, a statement on a form approved by the Director, signed by the owner or operator of the downstream sewage collection system, affirming that the downstream system can maintain the performance required by subsection (B) when receiving the increased flows;
 - 3. A general site plan showing the boundaries and key aspects of the project;
 - 4. Construction quality drawings that provide overall details of the site and the engineered works comprising the project including:
 - a. The plans and profiles for all sewer lines, manholes, force mains, depressed sewers, and lift stations with sufficient detail to allow Department verification of design and performance characteristics;
 - b. Relevant cross sections showing construction details and elevations of key components of the sewage collection system to allow Department verification of design and performance characteristics, including the slope of each gravity sewer segment stated as a percentage;
 - c. Drainage features and controls, and erosion protection as applicable, for the components of the project; and
 - d. Horizontal and vertical location of utilities within the area affected by the sewer line construction;
 - 5. Documentation of design flows for significant components of the sewage collection system and the basis for calculating the design flows;
 - 6. Drawings, reports, and other information that are clear, reproducible, and in a size and format specified by the Department. The applicant may submit the drawings in a Department-approved electronic format; and
 - 7. Design documents, including plans, specifications, drawings, reports, and calculations that are signed, dated, and sealed by an Arizona-registered professional engineer. The designer shall use good engineering judgment by following engineering standards of practice, and rely on appropriate engineering methods, calculations, and guidance.
- D. Design requirements.
 - 1. General Provisions. An applicant shall design and construct a new sewage collection system or an expansion of an existing sewage collection system involving new construction, according to the requirements of this general permit. An applicant shall:
 - a. Base design flows for components of the system on unit flows specified in Table 1, Unit Design Flows.
 - b. Design gravity sewer lines and all other sewage collection system components, including, manholes, force

mains, lift stations, depressed sewers, and appurtenant devices and structures to accommodate maximum sewage flows determined as follows:

- i. Any point in a sewer main when flowing full can accommodate a peak wet weather flow calculated by multiplying the sum of the upstream sources of flow from Table 1, Unit Design Flows by a dry weather peaking factor based on upstream population, as tabulated below, and adding a wet weather infiltration and inflow rate based on either a percentage of peak dry weather flow or a gallons per acre rate of flow;

Upstream Population	Dry Weather Peaking Factor
100	3.62
200	3.14
300	2.90
400	2.74
500	2.64
600	2.56
700	2.50
800	2.46
900	2.42
1000	2.38
1001 to 10,000	$PF = (6.330 \times p^{-0.231}) + 1.094$
10,001 to 100,000	$PF = (6.177 \times p^{-0.233}) + 1.128$
More than 100,000	$PF = (4.500 \times p^{-0.174}) + 0.945$

PF = Dry Weather Peaking Factor

p = Upstream Population

- ii. For a lift station serving less than 600 single family dwelling units (d.u.), use either of the following methods to size the pumps for peak dry weather flow in gallons per minute and add an allowance for wet weather flow and infiltration:
 - (1) Peak dry weather flow = $17 \text{ d.u.}^{0.42}$, or
 - (2) Peak dry weather flow = $11.2 (\text{population})^{0.42}$
- iii. If justified by the applicant, the Department may accept lower unit flow values in the served area due to significant use of low-flow fixtures, hydrographs of actual flows, or other factors;
- c. Use the "Uniform Standard Specifications for Public Works Construction" (revisions through 2004) and the "Uniform Standard Details for Public Works Construction" (revisions through 2004) published by the Maricopa Association of Governments, and the "Standard Specifications for Public Improvements," (2003 Edition), and "Standard Details for Public Improvements," (2003 Edition), published jointly by Pima County Wastewater Management and the City of Tucson, as the applicable design and construction criteria, unless the Department approves alternative design standards or specifications. An applicant in a county other than Maricopa and Pima shall use design and construction criteria from either the Maricopa Association of Governments or the Pima County Wastewater Management and the City of Tucson for the facility unless alternative criteria are designated by the Department.
 - i. This material is incorporated by reference and does not include any later amendments or editions of the incorporated material.
 - ii. Copies of the incorporated material are available for inspection at the Arizona Department of Environmental Quality, 1110 W. Washington, Phoenix, AZ 85007 or may be obtained from the Maricopa Association of Governments, 302 N. 1st Avenue, Suite 300, Phoenix, Arizona 85003, or on the web at <http://www.mag.maricopa.gov/archive/Newpages/on-line.htm>; or from Pima County Wastewater Management, 201 N. Stone Avenue, Tucson, Arizona 85701-1207, or on the

- web at <http://www.pima.gov/www/stdet>;
 - d. Ensure that sewage collection system components are separated from drinking water distribution system components as specified in 18 A.A.C. 5, Article 5;
 - e. Ensure that sewage collection system components are separated from reclaimed water system components as specified in 18 A.A.C. 9, Article 6; and
 - f. Request review and approval of an alternative to a design feature specified in this Section by following the requirements in R18-9-A312(G).
2. Gravity sewer lines. An applicant shall:
 - a. Ensure that any sewer line that runs between manholes, if not straight, is of constant horizontal curvature with a radius of curvature not less than 200 feet;
 - b. Cover each sewer line with at least 3 feet of earth cover meeting the requirements of subsection (D)(2)(h). The applicant shall:
 - i. Include at least one note specifying this requirement in construction plans;
 - ii. If site-specific limitations prevent 3 feet of earth cover, provide the maximum cover attainable, construct the sewer line of ductile iron pipe or other design of equivalent or greater tensile and compressive strength, and note the change on the construction plans; and
 - iii. Ensure that the design of the pipe and joints can withstand crushing or shearing from any expected static and live load to protect the structural integrity of the pipe. Construction plans shall note locations requiring these measures;
 - c. If sewer lines cross or are constructed in floodways:
 - i. Place the lines at least 2 feet below the level of the 100-year storm scour depth and calculated 100-year bed degradation and construct the lines using ductile iron pipe or pipe with equivalent tensile strength, compressive strength, shear resistance, and scour protection;
 - ii. If it is not possible to maintain the 2 feet of clearance specified in subsection (D)(2)(c)(i), using the process described in R18-9-A312(G), provide a design that ensures that the sewer line will withstand any lateral and vertical load for the scour and bed degradation conditions specified in subsection (D)(2)(c)(i);
 - iii. Ensure that sewer lines constructed in a floodway extend at least 10 feet beyond the boundary of the 100-year storm scouring;
 - iv. If a sewer line is constructed in a floodway and is longer than the applicable maximum manhole spacing distance in subsection (D)(3)(a), using the process described in R18-9-A312(G), provide a design that ensures the performance standards in subsection (B) are met; and
 - v. Note locations requiring these measures on the construction plans;
 - d. Ensure that each sewer line is 8 inches in diameter or larger except the first 400 feet of a dead end sewer line with no potential for extension may be 6 inches in diameter if the design flow criteria specified in subsections (D)(1)(a) and (D)(1)(b) are met and the sewer line is installed with a slope sufficient to achieve a velocity of at least 3 feet per second when flowing full. If the line is extended, the applicant seeking the extension shall replace the entire length with larger pipe to accommodate the new design flow unless the applicant demonstrates with engineering calculations that using the existing 6-inch pipe will accommodate the design flow;
 - e. Design sewer lines with at least the minimum slope calculated from Manning's Formula using a coefficient of roughness of 0.013 and a sewage velocity of 2 feet per second when flowing full.
 - i. An applicant may request a smaller minimum slope under R18-9-A312(G) if the smaller slope is justified by a quarterly program of inspections, flushings, and cleanings.
 - ii. If a smaller minimum slope is requested, the applicant shall not specify a slope that is less than 50 percent of that calculated from Manning's formula using a coefficient of roughness of 0.013 and a sewage velocity of 2 feet per second.
 - iii. The ratio of flow depth in the pipe to the diameter of the pipe shall not exceed 0.75 in peak dry weather flow conditions;
 - f. Design sewer lines to avoid a slope that creates a sewage velocity greater than 10 feet per second. The applicant shall construct any sewer line carrying a flow with a normal velocity of greater than 10 feet per second using ductile iron pipe or pipe with equivalent erosion resistance, and structurally reinforce the receiving manhole or sewer main;
 - g. Design and install sewer lines, connections, and fittings with materials that meet or exceed manufacturer's specifications consistent with this Chapter to:
 - i. Limit inflows, infiltration, and exfiltration;
 - ii. Resist corrosion in the ambient electrochemical environment;
 - iii. Withstand anticipated static and live loads; and
 - iv. Provide internal erosion protection;
 - h. Indicate trenching and bedding details applicable for each pipe material and size in the design plans. Unless the Department approved alternative design standards or specifications under subsection (D)(1)(c), the applicant shall place and bed the sewer lines in trenches following the specifications in "Trench

Excavation, Backfilling, and Compaction” (Section 601) revised 2004, published by the Maricopa Association of Governments; and “Rigid Pipe Bedding for Sanitary Sewers” (WWM 104) revised July 2002, and “Flexible Pipe Bedding for Sanitary Sewers” (WWM 105) revised July 2002, published by Pima County Wastewater Management. This material is part of the material incorporated by reference in subsection (D)(1)(b).

- i. Perform a deflection test of the total length of all sewer lines made of flexible materials to ensure that the installation meets or exceeds the manufacturer’s recommendations and record the results;
 - j. Test each segment of the sewer line for leakage using the applicable method below and record the results:
 - i. “Standard Test Method for Installation of Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air, F1417-92(1998),” published by the American Society for Testing and Materials;
 - ii. “Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method, C924-02 (2002),” published by the American Society for Testing and Materials;
 - iii. “Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines, C828-03 (2003),” published by the American Society for Testing and Materials;
 - iv. “Standard Test Method for Hydrostatic Infiltration Testing of Vitrified Clay Pipe Lines, C1091-03a (2003),” published by the American Society for Testing Materials;
 - v. “Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines, C969-02 (2002),” published by the American Society for Testing Material; or
 - vi. “Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications, D2321-00 (2000),” published by the American Society for Testing Materials; or
 - vii. The material listed in subsections (D)(2)(j)(i) through (vi) is incorporated by reference and does not include any later amendments or editions of the incorporated material. Copies of the incorporated material are available for inspection at the Arizona Department of Environmental Quality, 1110 W. Washington, Phoenix, AZ 85007 or may be obtained from the American Society for Testing and Materials International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959;
 - k. Test the total length of the sewer line for uniform slope by lamp lighting, remote camera, or similar method approved by the Department, and record the results; and
 - l. Minimize the planting within the disturbed area of new sewage collection system construction of plant species having roots that are likely to reach and damage the sewer or impair the operation of the sewer or visual and vehicular access to any manhole.
3. Manholes.
- a. An applicant shall install manholes at all grade changes, size changes, alignment changes, sewer intersections, and at any location necessary to comply with the following spacing requirements:

Sewer Pipe Diameter (inches)	Maximum Manhole Spacing (feet)
Less than 8	400
8 to less than 18	500
18 to less than 36	600
36 to less than 60	800
60 or greater	1300

- b. The Department shall allow greater manhole spacing if the applicant follows the procedure provided in R18-9-A312(G) and provides documentation showing the operator possesses or has available specialized sewer cleaning equipment suitable for the increased spacing.
- c. The applicant shall ensure that manhole design is consistent with “Pre-cast Concrete Sewer Manhole” #420-1, revised January 1, 2004 and #420-2, revised January 1, 2001, “Offset Manhole for 8” – 30” Pipe” #421 (1998), and “Sewer Manhole and Cover Frame Adjustment” #422, revised January 1, 2001, published by the Maricopa Association of Governments; and “Manholes and Appurtenant Items” (WWM 201 through WWM 211, except WWM 204, 205, and 206), revised July 2002, published by Pima County Wastewater Management. This material is part of the material incorporated by reference in subsection (D)(1)(b).
- d. The applicant shall not locate manholes in areas subject to more than incidental runoff from rain falling in the immediate vicinity unless the manhole cover assembly is designed to restrict or eliminate stormwater inflow.
- e. The applicant shall test each manhole using one of the following test protocols:
 - i. Watertightness testing by filling the manhole with water. The applicant shall ensure that the drop

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